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AUTHOR Hodges, Walter I.
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ABSTRACT

The Process Oriented Interactive Learning System postulated in this paper starts with the generation cf a set of process objectives fcr children which are based on the principles of development - intellectual and social - and related to the substance of the basic gcals which scciety holds for education: reading, language, number, independence, and cooperation. A sequential flcw of activities fcr bcth teachers and pupils is outlined and five implications arise. (1) Teachers must provide opportunities for the kinds of pupil behavicr that can be reinforced. (2) Priority must be given to processes which permit the child to transfer these processes from one learning situation tc anctber. (3) The teacher shculd approach teaching with an experimental attitude. (4) Teaching includes both active and passive processes. (5) Early childhocd education must continue to be acutely sensitive to the social and personal consequences of the progressive achievement decrement in disadvantaged children. If this learning System becomes successful in guiding program development, there should be less need for specialized prcgrams such as those designed for children with learning disabilities. (WY)

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# A Teaching Learning Schema for Teacher Training and Curriculum Development in Early Education

Walter L. Hodges
State College of Arkansas

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# A Model for Curriculum Development and Teacher Training in Early Childhood Education

Significant emphasis has recently been placed upon the problems and difficulties faced by disadvantaged children when they enter the public schools. The results of these difficulties are best summarized by the concept of a "progressive achievement decrement." The progressive achievement decrement label aptly describes data which show that disadvantaged groups of children enter the first grade retarded approximately one year in educational attainment and that this differential increases with schooling. Jerome Kagan (1969) has recently pointed out that today we are more concerned with early failures that were previously ignored, because these failures are now seen as the basis for serious psychological illness and because economic survival is closely tied to a minimum number of years of formal education. Successful completion of this period of formal schooling (12 years, most commonly) may well depend upon significantly improved educational opportunities in the early years. Existing intervention techniques have not been overwhelmingly successful in offsetting the progressive achievement decrement or in preventing school failures (Jensen, 1966).

Susan Gray (1966) has described the consequences of the inadequate intellectual-personal preparation for present forms of schooling as deficiencies in aptitudes for achievement and attitudes toward achievement. That is, the language and concept formation processes necessary for school achievement are not well developed among some disadvantaged groups and, in similar fashion, the devaluation of school learning and the relative lack

of persistence, achievement motivation, and ability to delay gratification among these groups tend to negate the potentially positive benefits of schoolin

Many compensatory education efforts are based solely on a hypothesis that implies deficiencies in the intellectual and social functioning of large numbers of children and this may explain the lack of sustained success in certain intervention programs. The teaching attitudes and strategies resulting from a deficit model may well be antithetical to the best interests of both the predominant and the less dominant cultural values of our society. These attitudes and strategies are, furthermore, debilitating to the abilities of the children who need our most positive and sophisticated efforts. But disadvantaged children are not necessarily deficient in intellectual skills and motivation. Frances Horowitz and Lucille Paden (1970) present a strong case for a "competing response" model of the functioning of the disadvantaged child. This model suggests that instead of being deficient in learning skills the disadvantaged child has learned well a large number of responses which interfere with the responses necessary to "make out" in formal public schooling. It is probably a combination of deficiencies and competing responses which make it so difficult for these children.

The negative consequences of poverty-related deficiencies and competing response repertoires on educational achievement, together with the evidence that these children are often nutritionally, medically, and psychologically disadvantaged has led to an emphasis on the search for ways to intervene effectively with young children. Head Start, one of the most general and popular of these programs, began in 1965. So far, both opinions and data regarding Head Start are in conflict. The Executive Summary of

the national study of Head Start concluded" ....that Head Start as it is presently constituted is insufficient as an independent compensatory program in establishing significant cognitive and affective gains which can be supported, reinforced, or maintained in traditional education programs in the primary grades" (Westinghouse, 1969). On the other hand, many primary teachers, more parents, and a few less global studies of individual programs found Head Start to produce beneficial results. Head Start, however, has not been a single-purpose or single-methods program and any evaluation must take into account both the multiplicity of purposes and the wide variety of techniques and programs included as a part of Head Start. Undoubtedly there are facets of Heat Start which have been effective with some children when implemented by appropriate teaching behavior.

Currently, several investigators are developing and testing models for intervention approaches. Dave Weikart at Ypsilanti, Michigan (1967) and Constance Kamii (1970) are developing early education strategies based on Piagetian concepts. Sara Smilanski (1964, 1968) is exploring socio-dramatic play with Israeli children and experiencing considerable success. Herbert Sprigle (Van de Riet, et al. 1968-69) in Jacksonville, Florida, Lasar Gotkin (1968) in New York City, and Glen Nimnicht (1968) of the Far West Educational Laboratory, are continuing to develop game approaches to be used in teaching concepts to young children. Sprigle's "Inquisitive Games" and Gotkin's "Matrix Games", "Language Lotto", and "Listen, Mark, and Say" are available from commercial sources, while Nimnicht's Toy Library is disseminated through the Laboratory. Rupert Klaus, Susan Gray and others at the Development and Research Center in Early Education (DARCEE)

are working to develop a model of early learning which includes, as crucial variables, the ecology of the child, the specification of objectives, and the development of teaching techniques. An early publication generated from The Early Training Project (Gray and Klaus, 1965), Before First Grade, (1966) is available. Hodges, McCandless, and Spicker (1967) explored diagnostically based curricula in the prevention of retardation in psychosocially deprived children. Behavior analysis approaches are well represented through the work of Don Buskell, Barbara Etzel (1968), and others at the University of Kansas. Ira Gordon has developed a parent involvement model through his work at the University of Florida (Gordon, 1969). Carl Bereiter and Siegfried Engelmann (1966) developed a direct teaching program in the areas of reading, language, and arithmetic skills. Materials for the Bereiter-Engelmann program are available commercially. The British Infant schools approach, representing an extreme of pupil-initiated learning, is receiving increasing attention in this country (Spodek, 1970). The New Nursery School approach of Glen Nimnicht, Oralee McAfee, and John Meier, 1968) has many features of an autotelic responsive environment which are being explored. Merle Karnes (1969) has reported on a research and development program for preschool disadvantaged children. These are but a sample of the programs. Many more are briefly described in Parker and Anderson (1970).

These experimental-developmental studies tend to support an optimistic view for the future of educational opportunities for young children. Some schools are changing their approaches to learning-teaching and are beginning to use parent and community resources, medical, nutritional,

psychological, and dental checkups and corrective procedures as important components of school learning. Some educators are re-assessing the discontinuity between pre-primary and primary programs. Many schools are in the implementation phase of some of these experimental modes of early education and are gradually adapting curriculum and teaching strategies to match the child's pre-primary experiences.

Nearly all of the programs mentioned above have considerable merit. Under certain conditions significant gains have been made in achievement or intelligence test scores by some children within all of the programs. What may be occurring is that teachers in these programs become highly involved (and therefore learn their tasks well) and attribute a self-fulfilling (or prophetic) importance and relevance to the program for the children that is usually found in traditional education only in classes taught by exceptional teachers. In nearly all the programs there is also an emphasis on the individualization of instruction. No child in an experimental program is ignored as often happens in a classroom with the typically low teacher-pupil ratio. Children receive reinforcement tailored to their individual requirements. The curriculum is often more flexible in the sense that the teacher feels no particular press to accomplish everything and she can adapt program as needs are identified. Finally, it appears that programs which clearly define their objectives and make plans to attain these with the children involved are more successful than those with less specific goals.

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The magnitude of our educational problems, however, is much greater than these few programs can hope to solve. And even though the

funds and social policy commitments available for revamping early education are woefully inadequate, money and commitment are not the sole reasons for the inability to develop individualized and effective learning situations for young children. In the first place, there is a reluctance on the part of some, to develop sufficiently specific objectives for children, since to do so may mean that some of the flavor of adventure, or discovery will disappear from early education. Second, there is the strong tendency to engage in stifling and divisive arguments around such dimensions as teacher-initiated versus child-initiated programming. The glow of enthusiasm is also fading from programs like Head Start with the consequent freezing of program development at a level which will prevent these programs from reaching their hypothesized potential. Finally, our knowledge of, and theories about, child development do not as yet provide sufficiently clear guidelines for building effective programming for young children.

We do know, however, that young children change rapidly within supportive environments. They learn attitudes toward achievement and aptitudes for achievement (Gray, 1966). Many of the essential variables of growth enhancing environments such as responsiveness and freedom are well-known. These principles, however, have seldom been placed in a systematic framework which enables the child development practitioner to apply them consistently or effectively with children. Likewise, there have been few significant attempts to place these principles within a conceptual system as explicit guidelines for those who wish to prepare people to work with young children.

Earlier preschool programs for young children have been directed, in the main, by a model designed to facilitate social growth (Hodges, 1967) while the adjacent level of education in the primary grades has been largely devoted to a model of language and number concept development with a particular emphasis on reading skill. Neither of these approaches to early education is wrong in any absolute sense. Nevertheless, it is the thesis of this paper that neither focus alone is sufficient for all children or, for that matter, even a majority of the children. The overwhelming evidence is that our success rate is too low with too many children. Take almost any criterion and the results are the same. Poor children enter school below the achievement levels of more affluent children and the gap widens as school progresses (Jensen, 1966). In some Head Start programs children scored better on intelligence tests after the Head Start experience but did not maintain or express these gains in better achievement (Westinghouse, 1969). Creative behaviors are systematically crushed during the elementary school years. Many, if not most, children get "turned off" by the process of schooling before the end of elementary school. Auditory, visual, other sensory-perceptual-motor, psychological, medical, and nutritional problems go undetected through inadequate, or non-existent, screening programs. Teacher-child interactions in many classrooms are predominately negative encounters. Some children are ignored completely. Boys dominate our lists of reading and behavioral problems among elementary and junior high children (McDavid, 1970).

Most of those concerned with child development and formal schooling are painfully aware of the shortcomings in our public system of education and, lest we forget, there are ample numbers of critics to remind us of these problems (Silberman, 1970; Mayer, 1961; Holt, 1964, 1969). We can empathize with the teacher of a self-contained elementary classroom who sallies forth each morning to take on a task for which his preparation has been largely too general. His resources are limited to a few state adopted basal reading series and texts. His position in the community's social hierarchy is lower than might be expected considering his educational background.

The task of the teacher of a self-contained elementary classroom, measured by almost any criterion is impossible.

He is taught abstractly, but he is told that he should teach concretely.

He is told to individualize instruction, but he is given no help in diagnoses, prescription, or planning.

He is told to improve his teaching, but receives no external professional, feedback to enable him to do so.

He is supposed to teach children basic skills when, in fact, the child has already learned the most important and intricate systems in human development - speech, language, and attitudes toward learning.

He is provided with no check on his exasperation and punitiveness, and few rewards for his benevolence, and good will.

A somewhat belated attack has been made on the first of these problems - inappropriate teacher preparation - by the commissioning of the development of nine models for the training of elementary school teachers. The

request for proposals stated the problem in the following manner: "Because of the key role that the teacher plays in facilitating learning, particularly with young children, he/she must have the most up-to-date theoretical and substantive knowledge and professional skills to perform successfully. To date, research and development activities have generated new knowledge materials, and methodologies with great potential for improving the effectiveness and efficiency of the teacher-learning process. If funds are made available, institutions should be able at this time to completely restructure their teacher education programs to include the best of what is now known and available". (from the U. S. O. E. Request for Proposals, October 16, 1967).

The University of Toledo started with a search "....for general goals of teacher education." The rationale of the Florida State University Model is based upon: 1) Predictions of what society and education will be like by 1978; 2) Inferences about the nature of teaching and the role of the elementary school teacher by 1978; and 3) Implications for the preparation of elementary school teachers. The University of Massachusetts model is based on performance criteria developed in three broad areas related to teaching: 1) content knowledge, 2) behavioral skills, and 3) human relations skills. The Michigan State Model Program is designed to achieve three major objectives: 1) A new kind of elementary school teacher for the nation's schools - one who is a basically well educated person. 2) A systematic introduction of research and clinical experience into the decision-making process as a basis for continued educational improvement. 3) A new kind of laboratory and clinical base upon which to found undergraduate and in-

service teacher education programs. The University of Pittsburgh model is devoted to individualizing instruction for children and specifies requirements in 1) academic education; 2) professional education; 3) teacher competencies; 4) a clinical setting; and 5) a guidance component. The Syracuse Model includes six professional components based on six assumptions. These assumptions include: 1) the program should be characterized by a pluralistic, open dialogue involving students, teachers, and researchers...; 2) an uncertain future; 3) the model program will be relevant only if it has a built-in intent, action, feedback system for processing ideas and generating hypotheses to change the program; 4) the development of self-renewing teachers can be accomplished only by self-renewing persons; 5) learning styles, learning rates, and what a person considers important to learn, in part constitute the uniqueness of each individual; 6) a cooperative among teacher education institutions, public schools, and the designers and developers of educational materials and programs working together in a responsible fashion are necessary. The Columbia University Model Program identifies four roles for the teachers; 1) The institution builder; 2) the interactive teacher; 3) the innovator; and 4) the scholar (Blewett, 1969).

The point of the preceding paragraph is that of the nine original program models, only one was obviously derived in any systematic way from an explicit statement of the objectives for child development. The single exception was produced by the University of Georgia Model (GEM) Program (Johnson, Shearron, Stauffer, 1968) which began by explicitly stating the elementary school objectives and the pupil behaviors necessary to guide children in acquiring characteristics represented by these objectives

From these pupil behaviors, teaching behaviors were derived. In principle, then, one can agree with Johnson, Shearron, and Stauffer's starting point (Blewett, 1969) for the development of a teacher training program.

The position taken in this paper is that we can never prepare child development specialists (including those we have traditionally called teachers) without first stating, as explicitly as possible, the behaviors, the skills, and the processes of thought and action desirable for children and that we can never be explicit about these objectives without ascertaining, as clearly as possible, the nature of the motivations, thought processes, and skills of the children with whom we work. In other words there must be an interaction between the demands of society, usually formulated in the goals of education or the objectives of an instructional sequence, and the nature of the child and his development. In principle then, the behaviors of the child development specialists, particularly as they interact with the child, can be derived from this analysis of the interaction of objectives and the principles of child development.

During the past year the staff of the Southwest Center for Early Childhood Personnel Development has been evolving a schema for teacher training and curriculum development which helps identify, in a somewhat parsimonious manner, those variables which can form the basis of a Process Oriented Interactive Learning System for Young Children. Initially, we called this system the Behavior Oriented Prescriptive Teaching Approach, but we believe that the "process" and "interactive" concepts better convey our commitment to a learning to learn approach, an open system which emphasizes the individualized and personal nature of learning and development.

The system starts with the generation of a set of process objectives for children which are based on the principles of development - intellectual and social - and related to the substance of the basic goals which society holds for education, e.g., reading, language, number, independence, cooperation. An outline of the strategy for generating objectives is displayed in Figure 1.

The scheme begins with the arbitrary division of human behavior into the areas of Sensory-Perceptual-Motor, Intrapersonal, Interpersonal, and Cognitive Processes. These divisions are based on: 1) The need to spell out sensori-perceptual-motor skills so that no child is denied the opportunity to reveal sensory impairments early in his schooling; 2) The need to examine separately and provide learning opportunities for those processes related to intrapersonal and interpersonal behavior in order to offset the tendency to assume that these processes will be learned as a natural by-product of cognitive learning; and 3) The need to systematically provide for opportunities for learning cognitive processes (without providing these opportunities, disadvantaged children will be unable to cope with the routines of schooling and the emphasis on subject-matter).

An analysis of personality development, intellectual tasks, motor learning, and self-concept theory yields a number of processes in each area. For example: cooperative behavior (personality), concept formation (intellectual), discrimination (motor learning), and self-evaluation-internal laws of reinforcement (self-concept) are each a desirable process objective for children.

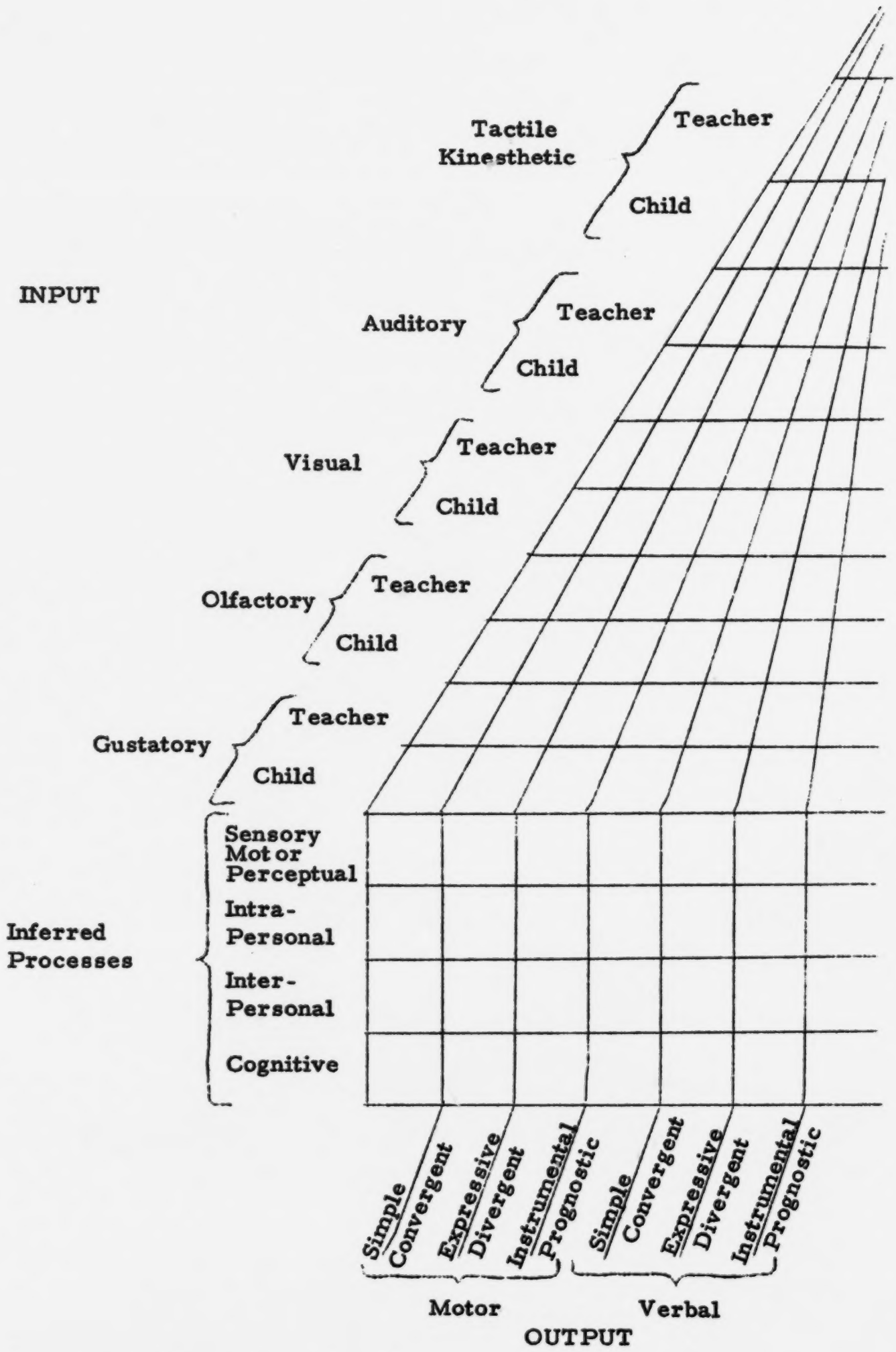



**Figure 1. A Schema for generating process objectives for young children.**

Each of these processes can be categorized as an inferred process (motor, intrapersonal, interpersonal, cognitive) and objectives generated by analyzing the sequential behaviors which make up the process. After a number of these processes have been identified objectives can be generated by choosing tasks using each Input category - gustatory, olfactory, visual, auditory, tactile-kinesthetic - once for teacher initiated activity and once for child initiated activity and once for each output category - motor or verbal. Such an exercise will result in a possible set of 60 operational objectives for each process identified.

The process of objective generation depends heavily upon the appropriate identification of the necessary learning-to-learn processes from the principles of human development including cognitive, developmental and personality theories. In addition, it is expected that an analysis of psychometric indices already available will yield a number of learning-to-learn processes. The Structure of Intellect, Model (Guilford, 1967), the Primary Mental Abilities (Thurstone, 1957), the Stanford-Binet Intelligence Scale., the Wecksler Preschool and Primary Scale of Intelligence, and other systems are the results of previous analyses of human learning processes and can yield valuable clues for early education.

The Process Oriented Interactive Learning System is based on the assumption that all activities and teaching strategies for children should be derived from an analysis of the objectives for children generated from the schema in figure 1. A general outline of topics included within each behavioral domain follows.

Sensory Perceptual-Motor Processes include:

A) General Physical development; B) gross motor skills, such as, basic forms of movement, patterns and rhythms, directional movement, body control, balance, aim and accuracy, and path following; C) fine motor skills, such as stacking, placing, and aligning objects, manipulating fasteners and locks, using simple tools, pouring, drawing and writing, threading, and hard coordination; D) discrimination skills, such as visual discrimination of shape, color, size, position, part-whole relations, auditory discrimination of sources of sound, intensity, pitch, direction, distance, duration, rhythm, and stress patterns, tactile discrimination of temperature, texture and shape, and gustatory discrimination of sour, sweet, salty and bitter; and, E) spatial relationships, such as search strategies, map reading, and so on.

Intrapersonal Processes include:

A) Orienting and attending, such as listening for a period of time; B) self-care and independence, such as tying shoes, keeping clean, dressing self; C) self-knowledge and awareness, such as who am I? , where do I live? ; D) self-acceptance, such as demonstrating confidence in self; E) self-expression; F) impulse control, learning to inhibit inappropriate responses G) delay of gratification, such as waiting for snacks; H) achievement motivation, such as desiring to improve performance; I) perseverence, sticking to a project; J) self-reward and evaluation, such as learning to reinforce self, and to control own behavior; and K) appreciation of humor, such as identifying incongruities in situations.

Interpersonal Processes include:

A) Cooperation; B) asking for help; C) giving help; D) sharing material possessions; E) following rules; F) expressing feelings and emotions in regard to other people; G) engaging in discussion with adults and children; H) arbitrating differences; and, I) role-taking, such as assuming the part of a father, teacher, friend, and so on.

Cognitive Processes include:

A) Language - type; B) Language - function; C) Language - form; D) Memory Skills; E) Plan - Following and Pattern - Recognition; F) Using Examples and Classification; G) Generalization and Transfer; H) Problem-Solving Skills; and I) Quantification - Mathematical Representation.

Within each of these four categories, process objectives must be specified in such a manner that a child can attain desirable process objectives through the development of those sub-skills which lead to and are included within a higher order behavior and through a program which provides opportunities to consolidate these sub-behaviors and apply them to the solution of problems. Process objectives are operational when they, 1) specify what the teacher is to do; 2) state what action or response the child is to make, and 3) allow the teacher to assess the degree to which the child has attained the objective. For example, a common objective for a five-year child is "To know the basic colors". This objective may, or may not be, a valid one. But, under most circumstances, it is not precise enough for designing a learning situation. How does the teacher know when a child "knows" the basic colors. A more helpful statement of a sub-objective may be: Given

an array of different colored strips of paper the child can select the appropriate strips when the teacher asks for each color.

The Process Oriented Interactive Learning System proceeds from 1) the generation of specific terminal (molar, more complex) processes to be attained by children 2) to the analysis of these behaviors into the more molecular (less complex) sub-behaviors which make up the more molar behaviors; and finally 3) to the sequential ordering of these sub-behaviors into a teaching program moving from the simplest, through the more complex, and, on to the most complex behavior in the sequence. A first approximation to a basic list of objectives for the Process Oriented Interactive curriculum is contained elsewhere. (Working Paper #2, 1970).

At the present stage of development in the field of early childhood education, it is necessary to be somewhat arbitrary in the generation of process objectives for young children. The generation of objectives through the schema of Figure 1 has been based on research data from child development, theories of development, knowledge of the kinds of skills needed to succeed in school tasks, and hypothesized estimates as to what may prevent later learning disabilities. Data on general learning strengths and weaknesses of disadvantaged children are used to establish priorities among such a wide array of objectives. Time constraints imposed on early childhood programs dictate priorities based on a "best guess" as to the most important behaviors to be developed among young children.

Many early education advocates will agree, for example, that certain sensory-perceptual-discrimination processes are essential precursors to the development of adequate information processing <u>sets</u> among young

children. Given an array of similar items, it is expected that children will be able to identify similar objects and point out those objects that differ on the basis of perceptual cues such as shape, size, color, texture, sound, or function. A wide variety of tasks can be developed to teach and test for these types of discrimination processes in all perceptual modalities. Such processes are essential for classification and concept formation tasks which, because they are more complex, follow perceptual discrimination in the hierarchy of the curriculum.

In similar fashion, it has been noted by students of individual differences that the disadvantaged child is penalized in our schools because of his repertoire of competing responses, or lack of such intrapersonal skills as impulse control, persistence, delay of gratification, and achievement motivation. The designer of an early learning curriculum must specify behaviors related to these skills and then design teaching situations directed toward their attainment.

In summary, to this point; we have described a schema for generating process type objectives (Figure 1) in four domains of behavior. A program for training teachers to work with young children should follow (rather than precede) the use of this schema which has yielded a resonable set of objectives. These objectives should be sequentially (hierarchically) arranged from the simple to the more complex behaviors to be attained. These objectives will serve as guides to the analysis of children and the selection of tasks. The better we are able to identify objectives for children, the more efficient becomes our selection, creation, and testing of teaching materials and tasks which are relevant to the objectives.

Each process objective must next be analyzed for its interaction with a schema essentially derived from the theory of instruction described by Gagne (1970) and elaborated by our work at the Center. The three dimensional outline of the system is described in Figure 2. Figure 2 is the outline of a theory which suggests that the learning of any behavior can be facilitated by designing experiences which account for interactions among instructional behaviors, the child's learning behaviors, and the type of learning involved.

The Teaching-learning schems outlined in figure 2 denotes the necessary conditions for assuring a minimum attainment of specified process objectives for young children. This approach required continual diagnostic teacher-child interactions which lead to the creation of appropriate stimulus conditions for each child. The system represents one approach to initiating a resolution for the persistent educational problems of children and teachers. The approach is prescriptive in the sense that a teacher provides for learning opportunities for a child based upon an analysi of the child's behavior with respect to a particular objective. The teacher selects or creates those activities which represent a "just manageable difference" between the behaviors available and the behaviors required for successful task completion. Process Oriented Interactive Learning is based on 1) the sequential-developmental learning behaviors of children; 2) the teacher behaviors required in planning, interacting, and following children's learning including those principles of learning and motivation which maintain and enhance the attention, perseverance, and learning abilities of children; and 3) the types of learning, ranging from simple

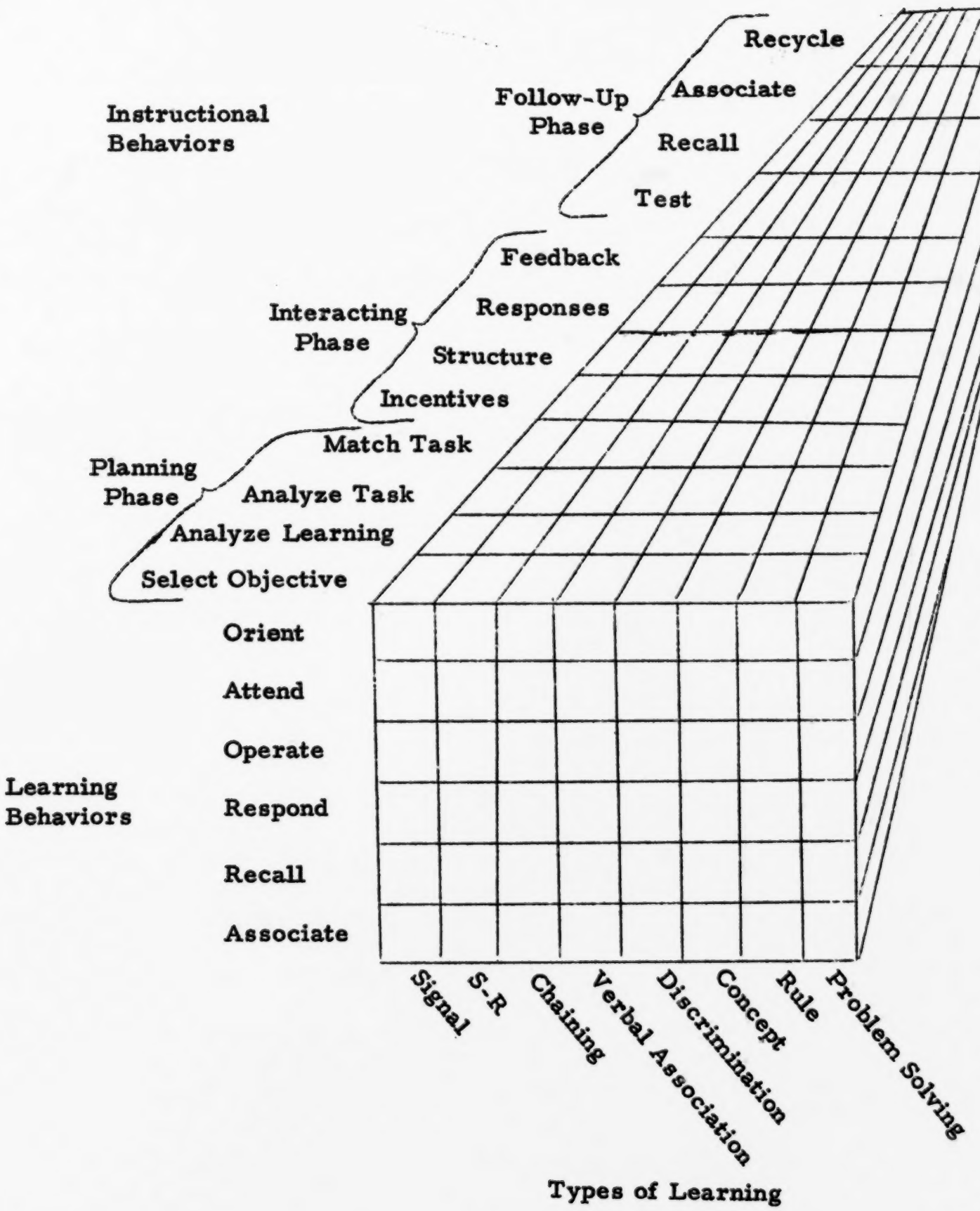



**Figure 2. An outline of the Teaching-Learning Schema for Early Education**

stimulus-response labeling to problem solving, which help define the processes of learning (Gagne, 1969).

The Process Oriented Interactive Learning System begins with the set of process objectives developed through the schema outlined in Figure 1. This is followed by an analysis of the teacher behaviors required for helping children attain those objectives, and implemented through activities selected on the basis of the type of learning required and the skills of the child. The interaction of these three parameters (child behavior, teacher behavior, type of learning) is the basis for a complete instructional system. The three parameters and their sub-components listed are specific enough to enable teacher-training and child development programs to focus on important factors, yet they are general enough to encompass many alternature approaches to the actual selection and presentation of stimulus materials and situations for children. For example, the same schema can be applied to the teaching of reading, writing, or arithmetic. The three parameters, and all that each suggests, are applicable to pupil-initiated activities as well as teacher-initiated activities, to the "open classroom", to team teaching, as well as to the ungraded primary, or continuous progress programs. The system can be implemented in single-teacher classrooms, but is more readily adapted to situations where there is more than one adult working in a classroom. The system is also useful in developing comprehensive programs for parents in working with their children.

The figure (Fig. 2) depicting the schema displays those key words related to the child's learning behaviors on its vertical dimension. On the horizontal dimension, the figure outlines eight types of learning to be con-

sidered in selecting appropriate learning episodes for children. The diagonal dimension of the figure outlines the essential types of instructional behaviors which are necessary in a potent learning environment. The schem should be read in such a way to suggest that: 1) the learning behaviors of children interact with the strategies of teacher behavior and types of learning -- or to say it another way, different types of learning require alternate teaching and learning behaviors, 2) content, or subject matter, should be selected by direct reference to the objectives for children, the instructional strategies available, and the level of learning behaviors in use. In general each objective should be studied in the light of each variable within each dimension of the teaching-learning schema. For example, the objective of teaching the processes (operations) involved in classification should be examined for the type of learning involved, the learning behaviors required, and, therefore, the differences in instructional behavior needed.

The schema implies no specific subject matter content but, rather, suggests that the emphasis is to be placed on the processes, operations, and skills involved in sensory-perceptual-motor, cognitive, and inter- and intrapersonal behavior and development. Subject matter, per se, is important to the extent that it is relevant to the child's experience, and can be presented as a useful vehicle for eliciting a process or developing a skill. Another way of expressing this idea is to suggest that no concept can be taught in the absence of specific content, but a specific concept is not as important as the idea or process of forming concepts, adopting appropriate role behavior, or utilizing sensory equipment well. For example, children are not "taught art" as a subject, but art activities are used as a potentially

satisfying experience to learn the processes of categorization based on shape and perspective, color or number, or perhaps, most important, to learn expressive modes of behavior. "Community helpers" as a unit of study is only one way to work toward the objective of effective inter-personal relations. The emphasis on process over product, and skills over specific concepts should be evident in the Process Oriented Interactive Learning System classroom.

In the remaining portion of this paper each dimension of the schema in Figure 2 is briefly discussed.

Instructional Behaviors

It is impractical, if not impossible, and probably undesirable to get 15, 20 or 35 children under the supervision of a single teacher involved in a single task at the same time and yet in many classrooms this is the model of teaching used. It is necessary, therefore, to pay more than lip service to the need for individualization of instruction for interactive teaching. Continuing to teach all children as if they: 1) have a similar background of experiences; 2) have a common repertoire of behaviors; 3) know how to label, categorize, and describe objects and events; 4) know how to use scissors, pencils and crayons; 5) know how to listen to stories; 6) have efficient orienting and attending skills; 7) know their own abilities; and 8) think well of themselves is a cardinal mistake. These considerations lead to the development of the diagonal dimension of the learning system, Instructional Behaviors. These instructional behaviors appear to be the essential skills of adequate teaching and can form the basis of a teacher

preparation program. Instructional behaviors are divided into three phases; Planning, Interacting, and Follow-up. Each of the phases displayed along the diagonal dimension of the Interactive-Learning Schema subsumes a set of behaviors required by competent teaching (See figure 3).

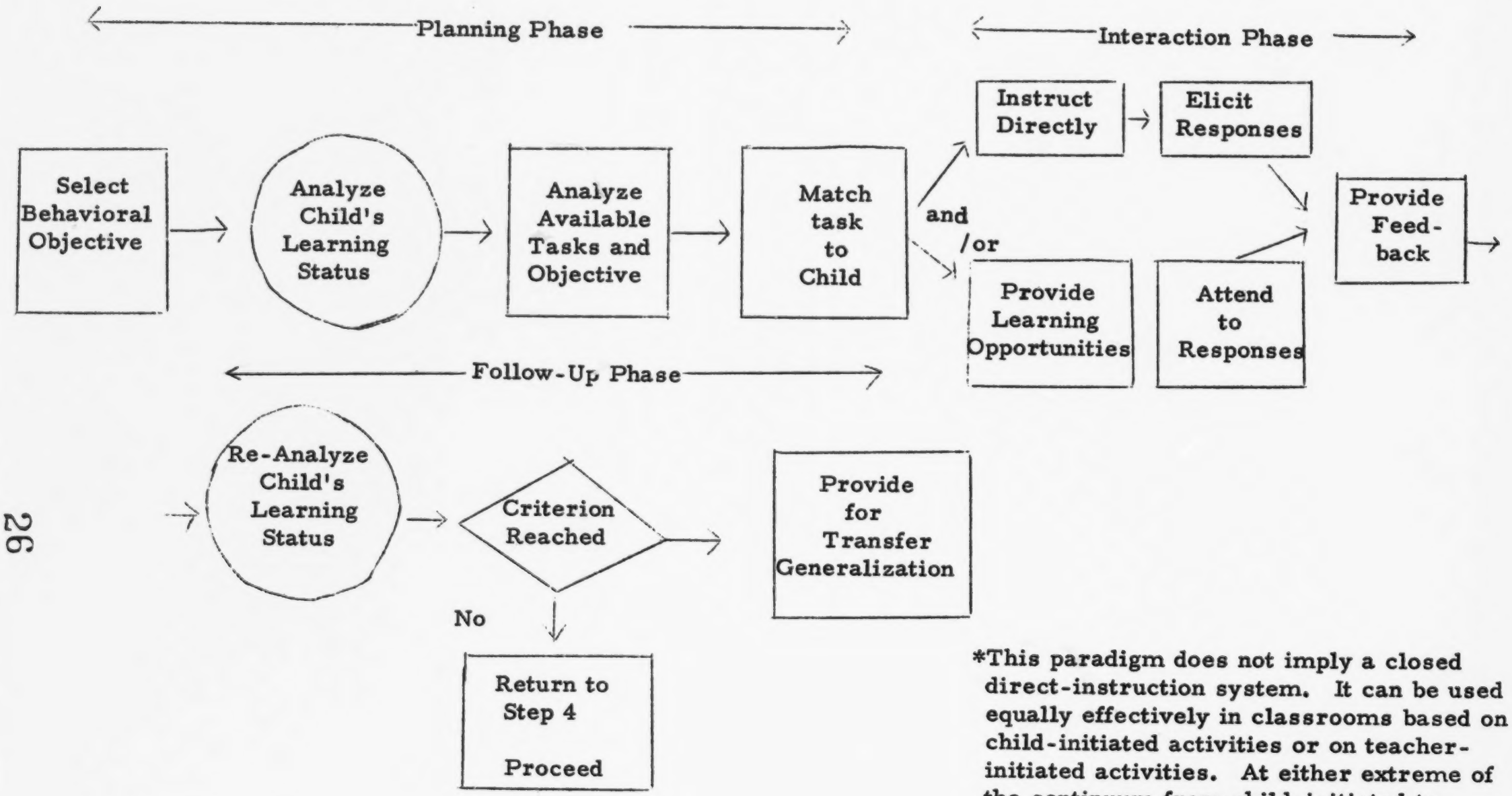
The Planning Phase

The Planning Phase includes four interrelated instructional behaviors; selecting objectives and analyzing children's learning status, analyzing tasks and matching tasks to the child's learning status.

Selecting Objectives. Even when objectives have been generated according to the schema outlined earlier in this paper there still remains the task of selecting those objectives which are relevant to the children under consideration. A thesis of this paper is that priority objectives must be selected based on the predominant needs of the individuals within a particular instructional unit. Bereiter and Engelmann (1966) have argued well for differentiation of objectives for different groups of children based on their previous learning experiences. Common objectives for all children may well be one of the most critical factors in producing the well-known progressive achievement decrement. Certainly, non-differentiated objectives produce an instructional set among teachers which helps generate the teaching for objectives rather than teaching for children.

Given a particular child, or group of children, and a realistic set of objectives for those children, a teacher must be able to analyze the behaviors available to each child which are necessary precursors of the particular objectives before selecting the appropriate learning tasks leading to the objective. There are a number of ways of accomplishing an analysis of the

Figure 3: A Flow Diagram of One Teaching Learning Paradigm*




*This paradigm does not imply a closed direct-instruction system. It can be used equally effectively in classrooms based on child-initiated activities or on teacher-initiated activities. At either extreme of the continuum from child-initiated to teacher-initiated we believe that it is necessary to approach the learning situation in an analytical fashion similar to that which is proposed in the above diagram.

behavioral repertoire of children. Behavioral observation checklists are helpful when these have been designed with relevance to particular objectives. In the absence of such checklists, the teacher may list for himself the necessary skills for any task and check each child to see if these skills are within the child's repertoire. The teacher may begin at the lowest possible point in a series of tasks related to the objective and work with children to note those who do not have the prerequisite skills. Where the preceding skills are not available to a child, those preceding skills should become the immediate objective for each child showing a lack of these skills. This approach is the essence of interactive (prescriptive-diagnostic) teaching.

The teacher, as diagnostician, is alert to the difficulties that each child demonstrates in any lesson and notes these for recycling future lessons. The crucial teacher behavior in diagnostic teaching is that of observational skills. Learning plans should include diagnostic hints for teachers so that they observe inappropriate behaviors. Informal behavior check lists accompanying each set of behavioral objectives are helpful in keeping track of difficulties.

Task Analysis, and Matching Tasks to Children's Level.

Without an analysis of the tasks relevant to a particular objective, a teacher is unable to engage in interactive-prescriptive-diagnostic teaching. Task analysis is the ability of the teacher, when given a particular objective, to analyze that objective into a hierarchical set of all the preceding skills necessary to accomplish the objective. A clear and concise treatment of this instructional skill is found in Resnick (1967).

In general, task analysis consists of specifying the terminal behavior to be attained by children, breaking the terminal behavior into as many sub-parts as possible, choosing an apparently appropriate sequence, and programming activities for each of these sub-behaviors leading to the terminal behavior.

The competent teacher is able to produce a situation in which the task to be accomplished by each child represents skills which are a "just manageable difference" between those skills the child has available and a step toward those which he is to attain. The problem of the match (Hunt, 1961) is of great importance and the inability of our present methods of instruction to fully capitalize on this principle accounts for much of the failure of current curricula and teaching to progress beyond the stage of crude art. It is certain, however, that without some estimates of the behavioral repertoire of a child and the behavioral repertoire required by a particular objective, we will continue to foist inappropriate experiences on a captive audience.

Professor Hunt makes the above points exceptionally well:

"Although this task of matching environmental circumstances to already assimilated schemata (behavioral repertoire) is of the utmost importance in teaching and in assessing environment for its capacity to promote development, what is involved in the matching is still vague. At this stage of knowledge, the matching process is essentially a matter of empirical trial and error (Hunt, 1961 p. 272). It is clear, however, that the error is reduced when both the objective and child have been assessed for skills required and skills available, respectively.

The teaching behaviors to be included in the process of matching the task to a child are those of: 1) creating an appropriate learning environment; 2) selecting appropriate entry points for each child based on the preceding learning analyses; 3) choosing the appropriate modality or modalities for presentation; 4) matching learning style; 5) choosing familiar and novel materials; 6) and capitalizing on existing interests.

1) Creating an Appropriate Learning Environment. Provision of an aesthetically pleasing learning environment is important. The physical setting should be attractive and well-organized. Visual displays should be uncluttered and at an eye-level appropriate for children, not adults. Drapes and other window dressings should make a pleasing background, rather than serve as focal points or distractions. Basic materials of high quality, easily cleanable, and adaptable for many uses should be purchased. Material should be available for children to see, feel, and manipulate in their spare moments or during self-selection learning periods. The teacher should express his own tastes in art, music, and literature and should provide manipulable displays of these interests for children when possible. Bulletin boards, when necessary, should be used for children (not for adults) and children should be allowed to exercise their judgment as to what is a well-balanced, pleasing board. The room should reflect the temperament and tastes of both teacher and children, not the one as opposed to the others. Cleaning materials should be provided for children and help given them with respect to their proper use.

Music, art, dramatic, and other game-like activities should be used

wherever possible in the teaching of language, memory, auditory-discrimination and rhyming, and other related activities. The association of these communication modes in positive learning experiences with children may well lead to the development of fairly high order aesthetic tastes on the part of children. Creative expression through these communication modes should be encouraged.

2) Selecting Appropriate Entry Points. Learning Occurs when an experience can be assimilated to previous learning and the amount of accommodation required of a child is small enough to provide some discomfort but not so large that anxiety is provoked. Children who are learning discriminations among objects can begin with gross differences and gradually learn finer distinctions so that more difficult analyses follow successful applications of the discrimination processes.

Learning episodes should be designed with gradually increasing degrees of difficulty so that the teacher may ascertain the points at which children have difficulty. Diagnosis through learning experiences is the key to determining entry levels for each child in a group. The teacher is alert for the child who appears not to attend, who may not follow the directions for a task, who may not understand key words used in instruction, and is always prepared to group and regroup children on the basis of the teacher's analysis of which preceding skills children lack.

3) Choosing Presentation Modalities. A comprehensive early education curriculum will include objectives which use every presentation mode - visual, auditory, tactile, kinesthetic, olfactory, gustatory - and require

responses which are both motor and verbal. In every case, where possible, each objective will be written for each presentation mode and each response mode, and will include both teacher - and child-initiated activities. Only as each presentation and response mode is used will the teacher be able to ascertain preferred modalities of input and response for each child.

Educational methodology courses spend much time on task presentation, but these courses usually fall short of analyzing the most appropriate presentation modes for particular objectives. A lack of understanding of the influence of presentation mode on the behavior to be developed is apparent. When to lecture, when to question, when to demonstrate, when to model, when to role play, when to dramatize, when to use the visual, or tactile-kinesthetic senses, all depend on the nature of the objective to be attained or the behavior to be displayed by the child as evidence of having attained a particular objective. There are specific teacher behaviors related to the selection of presentation mode as well as certain behaviors with each presentation mode which are important teacher competencies.

4) Matching Learning Style. Children differ on the ways in which they can receive and process learning experiences. Consideration of these differences is an important aspect of satisfying the problem of the match.

5) Choosing Familiar and Novel Materials. Early Education materials should be chosen with respect to their congruence with the objectives of the curriculum. An analysis of the materials available and those which can be created can be made from examining both the modes of input and the modes

of response required by each item. In addition it is apparent that the type of cognitive or affective process required by the material can be determined by examining the type of learning implied by the material, e.g., stimulus-response, chaining, concept formation, problem solving.

In addition to these considerations, however, is the very important balance between familiarity and novelty. Familiar materials are easily handled by children but novelty provides an incentive for exploration. Materials can be too unfamiliar, too strange, too novel or they can be too familiar, too common.

6) Capitalizing on Existing Interest. The early education curriculum should provide for great degrees of self-determination in the selection and creation of learning episodes. Careful diagnosis should lead to considerable knowledge related to the interests of each child. Some children will display interests in make-believe, others will not. Some children will be exploratory and others will not. Careful analyses by the teacher will determine children's interests and around these interests different experiences can be used for both learning and reinforcement.

The Interaction Phase

The Planning Phase of Instructional Behaviors leads directly into the Interaction Phase. This phase is so labeled to indicate that the behavior included are typically those in which the teacher is in some sort of interacting relationship with the child depending upon the plans made in the Planning Phase. The Interaction Phase includes the instructional behaviors of Providing Incentives, Providing Structure, Eliciting Responses, Providing Feedback.

Providing Incentives. The most crucial aspect of any learning opportunity is the degree to which the children are motivated to learn. The teacher can only provide the incentive conditions for learning. Three types of instructional behavior have been identified under this section; 1) Securing and Maintaining Attention; 2) Involving children in setting personal goal and objectives; and 3)Communicating expectations and positive attitudes of "can do".

Providing Structure. Two classes of instructional behavior are included under this heading: 1) General stimulus setting modes; 2) Within mode operations. The general stimulus setting modes include the use of skills in lecturing, story telling, socio-dramatic play, role modeling, using media such as programmed booklets, listening stations, responsive toys and games, and so on.

The within mode instructional skills include pacing and sequencing within a lesson or learning episode, spacing between learning episodes and providing novelty, mystery, and complexity of sufficient power to elicit responses from children.

Eliciting Responses. Insufficient attention has been placed on the skills of response elicitation in developing the repertoire of instructional skills of those working with young children. Two separate sets of behaviors have been identified in this category: 1) Questioning techniques, and 2) Curiousity Arousal techniques.

Providing Feedback. Instructional behaviors in this category include those of appropriately analyzing behavior in order to choose and apply

positive and negative, primary or secondary reinforcement, provide knowledge of results, give a general climate of positive affect to a learning setting, appropriately use extinction procedures, punishment, contingency management, reflection, imitation, expansion, and other response modes.

The Follow-Up Phase. The Instructional Behaviors included in the Follow-Up Phase are: 1) Assessing Learning Progress, 2) Providing for New Learning Episodes; 3) Providing for Recall of Learned Processes; 4) Providing for Association and Generalization of Learned Processes.

Learning Behaviors. Learning behaviors are those behaviors which children must engage in, in order to learn. It is not sufficient in a learning system to call attention only to instructional behaviors to be implemented by a teacher. The rationale for the three dimensional system being described in this paper is that the phases of instructional behaviors - Planning Interacting, and Follow-Up - interact with the learning behaviors of children and with the type of learning required. For example, when a teacher is engaged in the behaviors required in child analysis he must be thinking about the child's skills in orienting, attending, operating, responding, recalling, and associating as well as determining whether the type of learning is simple or complex, signal or rule learning, and so on. The analysis of the child, then, is focussed on specific actions required of the child with respect to a particular type of learning (Gagne, 1969).

Orienting.

Children differ in the degree to which they will orient themselves to particular stimuli. Some children will need careful explication of the

task to be accomplished and will not focus on the task without concrete directions. Other children will need little teacher direction to orient themselves toward a task or toward certain stimuli and can engage in self-selection of learning activities. Teacher instructional behaviors related to orienting behaviors on the part of children include modeling and goal setting.

Attending.

While attention span is a phrase often misused there is a need to consider factors which tend to maintain attention once the child is oriented to a task. Here there is a definite interaction between a child's attending behaviors and the task or teaching strategies used for the attainment of some objectives. Teachers must provide, where necessary, those incentive conditions, task involvement procedures, enthusiasm, mystery, and excitement required to maintain attention for those tasks with which children must interact.

Operating. Young children must learn through operating upon learning materials. That is to say, little is to be gained by demonstrations, verbal descriptions, slide shows, field trips without concomitant activities which provide the child with the opportunity to manipulate, to sort, to explore, to create, to construct, to match, and/or to dramatize. Teachers must plan for these operations through the stimulus presentations and response elicitation modes of instructional behavior.

Responding. Children must respond to people and materials within learning episodes and teacher behaviors must be calculated to elicit responses from children and to provide feedback to the children.

Recalling.

Children must have the opportunity to recall previously learned processes periodically without the threat of the recall sessions being used as testing periods. Instructional behaviors providing for non-threatening recall are a necessary but often ignored part of the learning process for children.

Associating and Generalizing.

Learning becomes flexible and usable when the child learns to apply previous operations to new situations or when a series of earlier learned operations are put together to develop higher order concepts, rules, or to solve problems. Instructional behaviors should be designed to provide for such associations and generalizations and not left to the vagaries of chance.

Types of Learning.

Instructional behaviors and Learning Behaviors interact with the type of learning involved. The learning and instructional conditions vary with whether or not the objective to be attained is a simple one of learning appropriate responses to signals, stimulus-response associations, chaining, verbal associations, discriminations, concepts, rules, or solving problems (Gagne, 1969). Most early education curricular activities can be analyzed with respect to the type of learning involved and will cover the whole range of learning types.

## Summary

The outline of Instructional, Learning Behaviors and their interaction with the Types of Learning presented in this paper requires much more elaboration before implementation. To date, however, it has been helpful in the development of teacher training modules and curricular experiences for children.

It should be noted that both the Instructional and Learning Behaviors outlined represent a sequential flow of activities for both teacher and child. These sequences interact with one another and with the type of learning appropriate at any particular time in a child's development.

The implications of such an approach to the development of a system of instruction and a curriculum for children at the same time are many. The concurrent developmental process required makes quite clear that there are effects on children's learning by the particular teaching strategies used whether these be direct teaching, reactive teaching, or some other basic teaching style.

The system suggests some particular things which are involved in teaching and learning. First, teachers must elicit from children or provide opportunities for the kinds of behavior that can be reinforced. This means that some children may need to be led to behave since only overt behavior can be reinforced. Speaking, moving, and other operations that are engaged in by the child are types of behavior which can be reinforced. When a teacher restricts classroom activities to his own lecturing, children cannot respond and behave in ways that can be reinforced. When a teacher designs all learning experiences in a rigid structure children cannot

demonstrate their own operating style.

A second implication of the Process Oriented Interactive Learning System is that priority must be given to processes which permit the child to transfer these processes from one learning situation to another. This priority must be equal to that which is currently given to the processes of language, thought, perception, discrimination, psychomotor skills, and to particular subject matter.

A third implication is that one should approach teaching with an experimental attitude. There are many ways of communicating with children so that they master the processes of learning and the sensitive, experimentally oriented teacher is going to search for those modes of communication which are effective with each of the children. As was said earlier, the crucial problem of the match is certainly a trial and error affair now and only a teacher who can tolerate some ambiguity as an experimenter will succeed.

A fourth implication is that teaching includes both active and passive processes. Teaching which allows children to proceed at random with no objective in mind serves no meaningful purpose. Teaching which always dominates the child will certainly have undesirable consequences. Teachers must become interacting participants in the child's learning process. Observation is important when the intent is to assess where children are so that we might begin with them at a realistic level. (Active participation may even make it mandatory for some teachers to wear slacks so they can be free to engage in socio-dramatic play on the classroom floor

until the children are able to carry on such play by themselves). This fourth implication does not suggest that the teacher initiate all learning activities.

A fifth implication is that early childhood educators must continue to be acutely sensitive to the social and personal consequences of the progressive achievement decrement problem. There is an educational imperative in the need to develop the intellectual, social, personal, and physical skills of young children and this need must be made more explicit to parents, to the power structure, and to the community at large. The need for urgency is apparent in the fact of the increasing demands for competence in the U. S.; the high proportion (20-25%) of children who learn to read poorly, or not at all; the high failure rates and drop outs; and the concomitant rise in the incidence of emotional disturbances among children and young adults in disadvantaged areas.

In conclusion, the purpose of the Process Oriented Interactive Learning System discussed in this paper is to present a framework for the building of programs which will allow for the development of more adequate human beings. If there is a greater success than in the past in building such programs there should be less need for specialized programs such as those designed for children with learning disabilities. There will be fewer children with learning disabilities.

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